

Calculus Warm Up #12-1

Evaluate:

1) $\int \sin^3 x \, dx$

2) $\int \frac{x^3 - x + 3}{x^2 + x - 2} \, dx$

This week's agenda:

Today: Finish 9.7

Tues: HW Quiz, pgs. 516, 526, 536, 553
Review (Pink WS turned in Friday)

Wed: Review (Tan WS turned in Friday)

Thurs: Test Part I, no calculator
HW: final exam review

Fri: Test Part 2, with calculator
HW: final exam review

HW Questions: p. 553

$$1. \int_0^4 \frac{1}{\sqrt{x}} dx$$

$$2) \int_3^4 \frac{1}{\sqrt{x-3}} dx$$

3. $\int_0^2 \frac{1}{(x-1)^{2/3}} dx$

4) $\int_0^2 \frac{1}{(x-1)^2} dx$

5. $\int_0^{\infty} e^{-x} dx$

6) $\int_{-\infty}^0 e^{2x} dx$

7. $\int_{-\infty}^0 xe^{-2x} dx$

9.7 Day 2... a couple more interesting examples

$$\begin{aligned}\int_0^{\infty} \sin x \, dx &= \lim_{b \rightarrow \infty} \int_0^b \sin x \, dx \\ &= \lim_{b \rightarrow \infty} \left[-\cos x \right]_0^b \\ &= \lim_{b \rightarrow \infty} \left[-\cos b + \cos 0 \right] \\ &= -\cos \infty + 1\end{aligned}$$

Since $-\cos x$ oscillates as $x \rightarrow \infty$,
it does not converge.

This situation is called: Divergent by oscillation.

$$\int_1^{\infty} (1-x)e^{-x} dx$$

$$= \lim_{b \rightarrow \infty} \int_1^b (1-x)e^{-x} dx$$

$$= \lim_{b \rightarrow \infty} \left[-(1-x)e^{-x} + e^{-x} \right]_1^b$$

$$= \lim_{b \rightarrow \infty} \left[-\frac{1-b}{e^b} + \frac{1}{e^b} + \frac{0}{e^1} - \frac{1}{e^1} \right]$$

$$= \lim_{b \rightarrow \infty} \left[\frac{b}{e^b} \right] - \frac{1}{e}$$

$$\frac{\infty}{\infty}$$

so use L'Hôpital's Rule!

$$= \lim_{b \rightarrow \infty} \left[\frac{1}{e^b} \right] - \frac{1}{e}$$

$$\frac{1}{\infty} \rightarrow 0$$

$$0 - \frac{1}{e}$$

$$\boxed{-\frac{1}{e}}$$

converges



One More:

$$\int_{-\infty}^{\infty}$$

→ choose a value between and split up the integral.

$$\int_{-\infty}^{\infty} \frac{4x}{9+x^4} dx$$



$$= \int_{-\infty}^0 \frac{4x}{9+x^4} dx + \int_0^{\infty} \frac{4x}{9+x^4} dx$$

$$= \lim_{a \rightarrow -\infty} \int_a^0 \frac{4x}{9+x^4} dx + \lim_{b \rightarrow \infty} \int_0^b \frac{4x}{9+x^4} dx$$

HW: p. 553,

11 - 25 odd, skip #13

Determine if it converges or diverges,
evaluate if it converges.